Distribution of Biomass and Caloric Energy in the Macrozooplankton Community of Frobisher Bay,N.W.T.

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Le titre exact paraît au haut du résumé de chaque rapport.

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ABSTRACT

Percy, J. A. and F. J. Fife. 1983. Distribution of biomass and caloric energy in the macrozooplankton community of Frobisher Bay, N.W.T. Can. Data Rep. Fish. Aquat. Sci. 387: v + 46 p.

This report serves as a repository for tabular data pertaining to the relative abundance, wet and dry biomass and caloric energy content of the principal macrozooplankton groups present during the open water season at two stations in Frobisher Bay, N.W.T. For the four dominant groups (ctenophores, chaetognaths, hyperiid amphipods and euphausiids) the results are also expressed in terms of the caloric energy present under 100 m^2.

Key words: Arctic macrozooplankton, biomass, caloric energy, abundance, Mertensia ovum, Sagitta elegans, Parathemisto libellula, Thysanoessa inermis.

RESUME

Percy, J. A. and F. J. Fife. 1983. Distribution of biomass and caloric energy in the macrozooplankton community of Frobisher Bay, N.W.T. Can. Data Rep. Fish. Aquat. Sci. 387: v + 46 p.

Ce rapport répertoirie les données tabulaires reliées à l'abondance relative, à la biomasse fraîche et sèche et au contenu d'énergie calorifique des principaux groupes de macrozooplancton presents l'été à deux stations dans la Baie de Frobisher, T.N.O. Pour les quatres groupes dominants (les cténaires, les chaetognathes, les amphipodes hyperidées et les euphausiacées) les données sont aussi exprimées en fonction de l'énergie calorifique présente dans une colonne d'eau de 100 m^2 de surface.

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INTRODUCTION

In Arctic and subarctic seas species of carnivorous macrozooplankton form an important trophic link between herbivorous microzooplankton and various vertebrate carnivores. Although much has been learned about the occurrence, population structure and general ecology of some of the common species (Dunbar, 1940; 1941; 1946; 1957; 1962: Grainger, 1971), little is known concerning the energetics of production.

The present study is part of a long-term research program on the bioenergetics of the principal macrozooplankton species in Frobisher Bay. It is useful initially to assess the relative energetic significance of the major groups in order to select ecologically important species for more detailed study. Studies thus far indicate that, on the basis of abundance and body size, hyperiid amphipods and chaetognaths are probably the principal carnivorous macrozooplankton in the region. However, ctenophores and coelenterates also appear to be abundant in the coastal waters, but because of difficulties in collecting and preserving them their abundance has never been adequately determined. Thus, the energetic significance of both ctenophores and coelenterates in relation to the hyperiids and chaetognaths is not clear. The great variation in size and organic composition of the different species precludes the use of numbers of individuals as a reliable method of comparing energetic importance. Basing comparisons on either wet or dry weight biomass determinations is also misleading given the very great differences in water and inorganic matter content

between such groups as amphipods and ctenophores. A more realistic approach is to base the comparison on the relative amount of energy, measured in calories, contained within each of the groups.

In this study we have examined the relative proportions of wet and dry biomass and caloric energy content of the principal macrozooplankton groups occurring during three consecutive open water seasons at two stations in upper Frobisher Bay. This is at best only a first approximation towards clarifying what is clearly a dynamic phenomenon. Estimating the proportion of available energy that is being utilized on a long-term basis by the dominant groups is a complex undertaking, requiring comprehensive information not only about fluctuations in biomass, but also about rates of energy consumption and transformation. These questions will be addressed in subsequent detailed studies on selected individual species.

METHODS

Macrozooplankton samples were collected by oblique net tows at two stations in upper Frobisher Bay during the open water seasons of 1979, 1980 and 1981 (see Lovrity, 1981 for station locations and pertinent oceanographic data). Station 5 on the eastern side of the bay is approximately 55 m deep. Station 51 located on the western side of the Bay is in a large trench and is approximately 200 m deep. The oblique tows were standardized as much as possible by using a method similar to that of Sands (1978). At each station a 1 metre ring net (1 mm mesh) equipped with a flow meter (except during the 1979 season) was lowered to a predetermined depth (50 m at station 5 and 175 m at station 51). The vessel then moved forward in a straight line at approximately 5 km/hr for two minutes at station 5 and 4 minutes at station 51. Timing commenced as soon as the wire began to move from the vertical and preliminary tests had shown that by the chosen time period the wire angle had stabilized. The vessel was then put into neutral and the net retrieved obliquely at a rate of approximately 0.5 m/s.

Four similar oblique tows were carried out at each station. The contents of one of the tows was preserved immediately in buffered formalin (5%) after first counting and removing cydippid ctenophores which do not preserve well. The other three samples were returned immediately to the laboratory in large insulated jugs of seawater held in insulated boxes. Ctenophores were removed from the samples immediately upon collection and transported in separate containers to

the laboratory. This was necessary to ensure that the voracious large ctenophores did not gorge themselves on the other zooplankton present in the sample.

In the laboratory the three live samples were pooled during sorting into the following taxonomic groups:

Hyperiidea

Gammaridea

Chaetognatha

Euphausiacea

Coelenterata

Ctenophora

Pteropoda

Decapoda

Polychaeta

Copelata (Appendicularia)

Fish larvae

Copepoda

The last category (Copepoda) consisted primarily of larger calanoid copepods and is not included in the analysis of the macrozooplankton groups. The pooled samples were rinsed in isotonic ammonium formate and drained on plankton netting over low vacuum (except for ctenophores and coelenterates which were carefully drained in a scoop). The wet weight of each group was measured prior to freezing. The frozen samples were freeze-dried and then transported to Ste. Anne de Bellevue.

The samples were redried to constant weight at 60° and the dry

weight determined. Those samples containing adequate material were finely ground and formed into pellets of 10-20 mg dry weight. Caloric content was determined with a Phillipson micro bomb calorimeter (Phillipson, 1964). Benzoic acid (20-40%) was added to tissues containing a high ash content (ctenophores, coelenterates and fish larvae) in order to ensure successful ignition of the sample.

The biomass of each taxonomic group in a sample was determined in terms of both wet weight and dry weight, and the percentage contribution of each component group was calculated. From the dry weight and the weight specific caloric value of each group, the caloric biomass was calculated and expressed as a percentage of the summed energy content of all the groups in the sample. In instances where the amount of tissue was inadequate for reliable caloric determination, the mean caloric value obtained for that group from all other samples was used to estimate the caloric biomass from the measured dry weight.

The formalin-preserved samples were sorted into the same principal taxonomic groups and then into species and counted.

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Table 1. Macrozooplankton samples collected by oblique tows at stations in Frobisher Bay.

Sample No.	Station	Date	Haul Depth (m)	Volume (m^3)*
TC79- 1	5	28.7.79	50	-
TC79- 2	51	29.7.79	175	-
TC79- 9	5	17.8.79	45	-
TC79-10	5	14.9.79	50	-
TC79-11	5	26.9.79	45	-
TC79-12	51	26.9.79	175	-
TC80-13	5	21.8.80	50	258.4
TC80-14	5	28.8.80	50	232.6
TC80-15	51	31.8.80	50	258.4
TC80-16	5	2.9.80	50	348.8
TC80-17	5	5.9.80	50	257.0
TC80-18	5	10.9.80	50	251.0
TC80-19	5	12.9.80	50	202.4
TC81- 1	51	5.8.81	175	628.5
TC81- 2	5	5.8.81	50	229.7
TC81- 3	51	11.8.81	175	704.9
TC81- 4	5	15.8.81	50	302.7
TC81- 5	51	19.8.81	175	764.5
TC81- 6	5	21.8.81	50	229.1
TC81- 7	51	4.9.81	175	472.0
TC81- 8	5	7.9.81	50	189.2
TC81-10	51	12.9.81	175	404.4
TC81-11	5	12.9.81	50	275.4

*Volume of 3 pooled tows used for gravimetric and caloric analysis.

Table 2. List of macrozooplankton species and total numbers of individuals collected in oblique tows at stations 5 and 51.

Taxonomic Group	Species	Total Number 5	51	Σ
Hyperiidea	Parathemisto libellula	71	141	212
	Parathemisto abyssorum	0	1	1
	Hyperia galba	1	1	2
Gammaridea	Onisimus glacialis	7	5	12
	Onisimus litoralis	0	1	1
	Apherusa glacialis	0	5	5
	Pardalisca cuspidata	0	1	1
Chaetognatha	Sagitta elegans	352	402	754
	Eukrohnia hamata	7	6	13
Euphausiacea	Thysanoessa inermis	3	108	111
	Thysanoessa raschi	0	16	16
	unidentified larvae	25	5	30
Coelenterata	Aeginopsis laurenti	1	1	2
	Aglantha digitale	11	12	23
	Sarsia tubulosa	5	1	6
	Sarsia princeps	3	1	4
	Bougainvillia superciliaris	31	21	52
	Euphysa flammea	7	1	8
	Hybocodon prolifer	23	4	27
	Halitholus cirratus	3	2	5
	Halitholus pauper	7	2	9
	Halitholus sp.	2	0	2
	Catablema vesicarium	3	3	6
Ctenophora	Mertensia ovum	341	269	610
	Beroe cucumis	189	5	194
Pteropoda	Spiratella helicina	125	6	131
	Clione limacina	1	2	3
Decapoda	unidentified larvae	151	12	163
Polychaeta	Autolytus sp.	12	10	22
	unidentified	0	4	4
Copelata	Oikopleura vanhoeffeni	2	10	12
Fish	unidentified larvae	5	0	5

Table 3. Numbers of individuals of each species collected in oblique tows at station 5.

Taxonomic Group	Species	TC79-1 A	TC79-1 B	TC79-1 C	TC79-9 A	TC79-9 B	TC79-9 C	TC79-10 A
Hyperiidea	Parathemisto libellula	12	7	11	2	6	3	1
	Hyperia galba	0	0	0	0	0	0	1
Gammaridea	Onisimus glacialis	0	0	0	0	0	1	0
Chaetognatha	Sagitta elegans	6	5	4	14	16	26	4
	Eukrohnia hamata	0	0	0	0	0	0	0
Euphausiacea	Thysanoessa inermis	0	0	0	0	0	0	0
	unidentified larvae	0	0	0	0	0	0	0
Coelenterata	Aeginopsis laurenti	0	0	0	0	0	0	0
	Aglantha digitale	0	0	0	0	2	0	0
	Sarsia princeps	0	0	0	1	1	1	0
	Sarsia tubulosa	0	0	0	0	0	0	0
	Bougainvillia superciliaris	1	2	0	3	0	0	0
	Euphysa flammea	0	2	1	0	0	0	0
	Hybocodon prolifer	0	0	2	4	2	0	1
	Halitholus cirratus	1	0	0	0	0	0	0
	Halitholus pauper	1	0	0	1	0	0	0
	Halitholus sp.	0	0	0	0	0	2	0
	Catablema vesicarium	0	0	0	0	0	0	0
Ctenophora	Mertensia ovum	5	11	3	20	24	18	23
	Beroe cucumis	0	0	0	0	1	0	0
Pteropoda	Spiratella helicina	0	2	1	1	0	0	0
	Clione limacina	0	0	0	0	0	0	0
Decapoda	unidentified larvae	35	42	24	6	17	11	1
Polychaeta	Autolytus sp.	0	1	0	0	0	1	2
Copelata	Oikopleura vanhoeffeni	1	1	0	0	0	0	0
Fish	unidentified larvae	1	0	0	1	2	0	1

Table 3 (continued).

Taxonomic Group	Species	TC79-11 A	TC79-11 B	TC79-11 C	TC80-13	TC80-14
Hyperiidea	Parathemisto libellula	3	1	0	3	1
	Hyperia galba	0	0	0	0	0
Gammaridea	Onisimus glacialis	0	0	0	5	0
Chaetognatha	Sagitta elegans	7	6	16	36	13
	Eukrohnia hamata	0	1	0	1	0
Euphausiacea	Thysanoessa inermis	0	0	1	0	1
	unidentified larvae	0	0	1	0	4
Coelenterata	Aeginopsis laurenti	1	0	0	0	0
	Aglantha digitale	2	3	1	0	0
	Sarsia princeps	0	0	0	0	0
	Sarsia tubulosa	0	0	0	1	4
	Bougainvillia superciliaris	0	0	0	0	0
	Euphysa flammea	0	0	0	0	0
	Hybocodon prolifer	0	1	3	2	0
	Halitholus cirratus	0	1	0	0	0
	Halitholus pauper	1	2	0	0	0
	Halitholus sp.	0	0	0	0	0
	Catablema vesicarium	1	1	0	0	0
Ctenophora	Mertensia ovum	35	55	24	27	10
	Beroe cucumis	1	6	2	15	1
Pteropoda	Spiratella helicina	0	0	0	0	121
	Clione limacina	0	0	0	0	1
Decapoda	unidentified larvae	0	0	0	1	1
Polychaeta	Autolytus sp.	1	1	1	0	1
Copelata	Oikopleura vanhoeffeni	0	0	0	0	0
Fish	unidentified larvae	0	0	0	0	0

Table 3 (continued).

Taxonomic Group	Species	TC80-16	TC80-17	TC80-18	TC80-19
Hyperiidea	Parathemisto libellula	2	2	1	0
	Hyperia galba	0	0	0	0
Gammaridea	Onisimus glacialis	0	0	0	1
Chaetognatha	Sagitta elegans	19	21	53	30
	Eukrohnia hamata	0	1	2	2
Euphausiacea	Thysanoessa inermis	0	1	0	0
	unidentified larvae	11	2	1	6
Coelenterata	Aeginopsis laurenti	0	0	0	0
	Aglantha digitale	1	1	0	0
	Sarsia princeps	0	0	0	0
	Sarsia tubulosa	0	0	0	0
	Bougainvillia superciliaris	0	0	1	0
	Euphysa flammea	0	0	0	0
	Hybocodon prolifer	0	0	0	0
	Halitholus cirratus	0	0	0	0
	Halitholus pauper	0	0	0	0
	Halitholus sp.	0	0	0	0
	Catablema vesicarium	0	0	0	0
Ctenophora	Mertensia ovum	11	38	15	6
	Beroe cucumis	24	21	81	37
Pteropoda	Spiratella helicina	0	0	0	0
	Clione limacina	0	0	0	0
Decapoda	unidentified larvae	0	0	0	0
Polychaeta	Autolytus sp.	2	1	1	0
Copelata	Oikopleura vanhoeffeni	0	0	0	0
Fish	unidentified larvae	0	0	0	0

Table 3 (continued).

Taxonomic Group	Species	TC81-2	TC81-4	TC81-6	TC81-8	TC81-11
Hyperiidea	Parathemisto libellula	9	3	1	0	3
	Hyperia galba	0	0	0	0	0
Gammaridea	Onisimus glacialis	0	0	0	0	0
Chaetognatha	Sagitta elegans	13	49	7	4	3
	Eukrohnia hamata	0	0	0	0	0
Euphausiacea	Thysanoessa inermis	0	0	0	0	0
	unidentified larvae	0	0	0	0	0
Coelenterata	Aeginopsis laurenti	0	0	0	0	0
	Aglantha digitale	0	0	1	0	0
	Sarsia princeps	0	0	0	0	0
	Sarsia tubulosa	0	0	0	0	0
	Bougainvillia superciliaris	6	9	8	1	0
	Euphysa flammea	0	1	2	1	0
	Hybocodon prolifer	0	4	3	1	0
	Halitholus cirratus	1	0	0	0	0
	Halitholus pauper	1	1	0	0	0
	Halitholus sp.	0	0	0	0	0
	Catablema vesicarium	0	0	0	1	0
Ctenophora	Mertensia ovum	4	6	3	1	2
	Beroe cucumis	0	0	0	0	0
Pteropoda	Spiratella helicina	0	0	0	0	0
	Clione limacina	0	0	0	0	0
Decapoda	unidentified larvae	0	13	0	0	0
Polychaeta	Autolytus sp.	0	0	0	0	0
Copelata	Oikopleura vanhoeffeni	0	0	0	0	0
Fish	unidentified larvae	0	0	0	0	0

Table 4. Numbers of individuals of each species collected in oblique tows at station 51.

Taxonomic Group	Species	TC79-2 A	TC79-2 B	TC79-12 A	TC79-12 B	TC80-15*	TC81-1
Hyperiidea	Parathemisto libellula	13	41	2	7	0	13
	Parathemisto abyssorum	1	0	0	0	0	0
	Hyperia galba	0	0	0	0	0	1
Gammaridea	Onisimus litoralis	0	1	0	0	0	0
	Onisimus glacialis	0	0	0	0	0	0
	Apherusa glacialis	0	0	0	0	0	0
	Pardalisca cuspidata	0	0	0	0	0	1
Chaetognatha	Sagitta elegans	14	6	43	68	6	21
	Eukrohnia hamata	0	0	2	4	0	0
Euphausiacea	Thysanoessa inermis	0	0	2	3	1	44
	Thysanoessa raschi	0	0	2	2	0	2
	unidentified larvae	0	2	0	0	3	0
Coelenterata	Aeginopsis laurenti	1	0	0	0	0	0
	Aglantha digitale	3	2	0	3	0	0
	Sarsia princeps	0	0	0	0	0	0
	Sarsia tubulosa	0	1	0	0	0	0
	Bougainvillia superciliaris	10	4	0	0	0	6
	Euphysa flammea	1	0	0	0	0	0
	Hybocodon prolifer	1	0	0	0	0	1
	Halitholus cirratus	0	1	0	0	0	0
	Halitholus pauper	0	0	0	0	0	1
	Catablema vesicarium	0	0	1	2	0	0
Ctenophora	Mertensia ovum	34	35	46	55	8	19
	Beroe cucumis	0	0	2	3	0	0
Pteropoda	Spiratella helicina	2	4	0	0	0	0
	Clione limacina	0	0	0	0	0	1
Decapoda	unidentified larvae	6	2	1	0	0	0
Polychaeta	Autolytus sp.	1	0	0	1	0	0
	unidentified	0	0	0	0	0	4
Copelata	Oikopleura vanhoeffeni	2	0	6	2	0	0

*from 50 m.

Table 4 (continued).

Taxonomic Group	Species	TC81-3	TC81-5	TC81-7	TC81-10
Hyperiidea	Parathemisto libellula	9	19	25	12
	Parathemisto abyssorum	0	0	0	0
	Hyperia galba	0	0	0	0
Gammaridea	Onisimus litoralis	0	0	0	0
	Onisimus glacialis	2	0	0	3
	Apherusa glacialis	2	0	0	3
	Pardalisca cuspidata	0	0	0	0
Chaetognatha	Sagitta elegans	57	32	48	107
	Eukrohnia hamata	0	0	0	0
Euphausiacea	Thysanoessa inermis	20	20	12	6
	Thysanoessa raschi	3	5	0	2
	unidentified larvae	0	0	0	0
Coelenterata	Aeginopsis laurenti	0	0	0	0
	Aglantha digitale	1	1	1	1
	Sarsia princeps	0	1	0	0
	Sarsia tubulosa	0	0	0	0
	Bougainvillia superciliaris	0	0	1	0
	Euphysa flammea	0	0	0	0
	Hybocodon prolifer	1	1	0	0
	Halitholus cirratus	1	0	0	0
	Halitholus pauper	0	0	0	1
	Catablema vesicarium	0	0	0	0
Ctenophora	Mertensia ovum	10	11	45	6
	Beroe cucumis	0	0	0	0
Pteropoda	Spiratella helicina	0	0	0	0
	Clione limacina	0	0	1	0
Decapoda	unidentified larvae	0	0	0	0
Polychaeta	Autolytus sp.	0	2	4	2
	unidentified	0	0	0	0
Copelata	Oikopleura vanhoeffeni	0	0	0	0

Table 5. Caloric content of various taxonomic groups of macrozooplankton during the open water season.

Sample No.	Taxonomic Group	n	$\bar{x}$	S.D.	S.E.
TC79- 1	Hyperiidea	5	4730	119	53
	Chaetognatha	3	5013	334	193
	Ctenophora	5	1712	447	200
	Pteropoda	1	4232	-	-
	Decapoda (ℓ)	5	4732	112	50
	Copepoda	5	7268	320	143
TC79- 2	Hyperiidea	3	4740	246	142
	Chaetognatha	3	5087	200	116
	Euphausiacea	3	5767	21	12
	Ctenophora	3	2387	115	66
	Decapoda (ℓ)	1	5000	-	-
TC79- 3*	Coelenterata	5	432	72	32
	Fish larvae	4	1240	275	138
	Mysidacea	5	3986	134	60
TC79- 4*	Hyperiidea	5	4442	262	12
	Pteropoda	5	3284	127	57
	Coelenterata	5	2628	244	109
TC79- 5*	Hyperiidea	5	4144	31	14
	Coelenterata	5	1086	154	69
	Ctenophora	5	1254	172	77
	Pteropoda	6	2947	78	32
	Decapoda (ℓ)	1	3630	-	-
TC79- 8	Hyperiidea	3	4817	139	80
	Gammaridea	2	3565	21	15
	Chaetognatha	3	5247	141	81
	Euphausiacea	3	6430	128	74
	Ctenophora	3	2010	60	35
TC79- 9	Hyperiidea	5	4656	108	48
	Chaetognatha	5	5162	260	120
	Euphausiacea (ℓ)	1	4400	-	-
	Coelenterata	3	1923	529	306
	Ctenophora	5	1476	142	64
	Pteropoda	1	4060	-	-
	Decapoda (ℓ)	4	4980	152	76
	Copepoda	5	7086	216	97

*Samples from Brevoort Island stations (Percy and Fife, 1980)

Table 5 (continued).

Sample No.	Taxonomic Group	n	$\bar{x}$	S.D.	S.E.
TC79-10	Hyperiidea	3	4567	176	102
	Chaetognatha	3	5140	238	138
	Euphausiacea	3	6910	329	190
	Ctenophora	3	1777	223	129
	Pteropoda	3	3967	40	23
	Fish larvae	2	4515	573	331
TC79-11	Chaetognatha	3	5150	46	27
	Coelenterata	3	2237	85	49
	Ctenophora	3	1600	70	40
TC79-12	Hyperiidea	3	5110	223	129
	Gammaridea	1	6290	-	-
	Chaetognatha	3	5720	399	230
	Euphausiacea	3	7070	296	171
	Coelenterata	3	2267	254	147
	Ctenophora	3	2017	21	12
	Polychaeta	1	5990	-	-
TC80-13	Hyperiidea	3	5220	56	32
	Gammaridea	2	5140	14	10
	Chaetognatha	3	5327	166	96
	Euphausiacea	3	6110	157	91
	Ctenophora	3	1617	153	88
TC80-14	Hyperiidea	3	5577	359	207
	Gammaridea	1	4700	-	-
	Chaetognatha	3	5247	328	189
	Euphausiacea (ℓ)	1	5090	-	-
	Ctenophora	3	1870	82	47
	Pteropoda	3	4563	91	52
TC80-15	Hyperiidea	3	4673	165	95
	Gammaridea	3	5223	253	146
	Chaetognatha	2	5860	509	360
	Euphausiacea	3	6497	177	102
	Ctenophora	6	1750	597	244
TC80-16	Hyperiidea	3	5020	166	96
	Chaetognatha	3	5103	168	97
	Euphausiacea	3	6230	115	66
	Ctenophora	2	1730	57	40
	Pteropoda	3	3850	35	20
	Polychaeta	1	5520	-	-

Table 5 (continued).

Sample No.	Taxonomic Group	n	$\bar{x}$	S.D.	S.E.
TC80-17	Hyperiidea	3	4660	66	38
	Gammaridea	2	4630	127	90
	Chaetognatha	3	4933	12	7
	Euphausiacea	3	7180	439	254
	Coelenterata	1	1890	-	-
	Ctenophora	3	1930	185	107
	Polychaeta	1	6130	-	-
TC80-18	Hyperiidea	3	4770	282	163
	Gammaridea	1	3980	-	-
	Chaetognatha	6	5258	200	82
	Euphausiacea	2	6180	778	550
	Coelenterata	1	2960	-	-
	Ctenophora	3	1690	375	216
	Decapoda (ℓ)	1	4660	-	-
	Polychaeta	1	5280	-	-
TC80-19	Hyperiidea	1	5140	-	-
	Chaetognatha	3	5180	132	76
	Euphausiacea (ℓ)	1	4200	-	-
	Coelenterata	3	1373	210	121
	Ctenophora	2	1765	191	135
	Pteropoda	1	3720	-	-
	Polychaeta	1	4680	-	-
TC81- 1	Hyperiidea	4	4168	74	37
	Gammaridea	2	4340	14	10
	Chaetognatha	5	4672	249	112
	Euphausiacea	4	5775	124	62
	Coelenterata	2	1125	21	15
	Ctenophora (c)	5	1388	64	29
	Ctenophora (b)	2	740	141	100
	Decapoda	1	4480	-	-
	Polychaeta	3	3947	393	227
	Copepoda	5	6140	302	135
TC81- 2	Hyperiidea	4	4463	98	49
	Gammaridea	1	4600	-	-
	Chaetognatha	4	4993	346	173
	Coelenterata	2	2350	14	10
	Ctenophora (c)	5	1636	104	47
	Ctenophora (b)	2	515	248	175
	Decapoda (ℓ)	4	5023	637	318
	Copepoda	4	7355	77	39

Table 5 (continued).

Sample No.	Taxonomic Group	n	$\bar{x}$	S.D.	S.E.
TC81- 3	Hyperiidea	5	4636	260	116
	Gammaridea	5	4600	250	112
	Chaetognatha	5	5106	481	215
	Euphausiacea	5	5768	316	141
	Coelenterata	3	1970	590	341
	Ctenophora (c)	5	1940	246	110
	Ctenophora (b)	4	985	45	240
	Pteropoda	4	4135	156	78
	Copepoda	5	6820	190	85
TC81- 4	Hyperiidea	4	4543	88	44
	Gammaridea	5	4324	59	26
	Chaetognatha	3	4533	196	113
	Coelenterata	4	1915	61	31
	Ctenophora (c)	5	2040	131	59
	Ctenophora (b)	5	1585	96	48
	Decapoda (ℓ)	3	4393	188	108
	Copepoda	5	6080	206	92
TC81- 5	Hyperiidea	5	4656	95	42
	Gammaridea	4	4533	211	105
	Chaetognatha	4	4778	161	81
	Euphausiacea	5	5926	503	225
	Ctenophora (c)	5	1722	132	59
	Ctenophora (b)	1	830	-	-
	Decapoda (ℓ)	1	4630	-	-
	Polychaeta	1	4240	-	-
TC81- 6	Hyperiidea	1	4320	-	-
	Gammaridea	2	4145	120	86
	Chaetognatha	5	4710	108	48
	Coelenterata	5	1774	237	106
	Ctenophora (c)	5	1644	118	53
	Ctenophora (b)	5	1160	347	155
	Decapoda (ℓ)	1	4300	-	-
	Copepoda	3	6350	369	213

Table 5 (continued).

Sample No.	Taxonomic Group	n	$\bar{x}$	S.D.	S.E.
TC81- 7	Hyperiidea	5	4428	54	24
	Gammaridea	1	5250	-	-
	Chaetognatha	5	5428	545	244
	Euphausiacea	5	6124	436	195
	Coelenterata	5	2802	91	41
	Ctenophora (c)	5	2186	214	96
	Ctenophora (b)	4	1225	178	89
	Polychaeta	1	4082	-	-
	Copepoda	5	7754	495	221
TC81- 8	Hyperiidea	5	5160	136	61
	Chaetognatha	1	5180	-	-
	Coelenterata	5	1554	286	128
	Ctenophora (c)	5	1754	117	52
	Ctenophora (b)	4	1493	389	194
	Copepoda	5	6984	314	140
TC81-10	Hyperiidea	5	5278	171	77
	Gammaridea	4	5510	47	24
	Chaetognatha	5	5336	412	184
	Euphausiacea	4	6290	131	65
	Coelenterata	2	1190	368	260
	Ctenophora (c)	5	1568	68	30
	Ctenophora (b)	5	676	222	99
TC81-11	Hyperiidea	5	4742	189	85
	Chaetognatha	2	5330	71	50
	Euphausiacea	4	6635	221	110
	Coelenterata	3	2310	151	87
	Ctenophora (c)	5	1808	209	94
	Ctenophora (b)	5	1434	315	141

Table 6. Mean caloric content of macrozooplankton groups during the open water season (based on 1979 to 1981 data).

Zooplankton group	n	Cal/g	S.D.	S.E.	C.V.
Hyperiidea (Amphipoda)	25	4746	354	71	7.5
Gammaridea (Amphipoda)	15	4722	675	174	14.3
Chaetognatha	25	5140	295	59	5.8
Euphausiacea	18	6032	811	191	13.4
Coelenterata	18	1876	661	156	35.2
Ctenophora	15	1772	261	67	14.7
Pteropoda	9	3859	488	163	12.7
Decapoda (larvae)	10	4583	420	133	9.2
Fish (larvae)	2	2878	2316	1638	80.5
Polychaeta	8	4984	865	306	17.4
Ctenophora (Cydippid)	10	1769	236	74	13.3
Ctenophora (Beroid)	10	1064	372	118	34.9
Mysidacea	1	3986	-	-	-
Copepoda (Calanoida)	9	6871	577	192	8.4

Table 7. Mean caloric content per unit dry weight of macrozooplankton at stations 5 and 51 (excluding copepods; value in parentheses for total sample including copepods).

Station 5		Station 51	
Sample No.	Cal/g	Sample No.	Cal/g
TC79- 1	2237 (3494)	TC79- 2	2828 (3439)
TC79- 9	1716 (3688)	TC79- 8	3076 (5144)
TC79-10	1962 (2835)	TC79-12	2383 (5040)
TC79-11	1641 (3514)	TC81- 1	4265 (4491)
TC80-13	1857 (3387)	TC81- 3	3607 (4429)
*TC80-14	4312 (5244)	TC81- 5	3344 (4317)
TC80-16	2216 (3938)	TC81- 7	3303 (4857)
TC80-17	2071 (3292)	TC81-10	2847 (4403)
TC80-18	1936 (4268)		
TC80-19	1967 (4014)		
TC81- 2	1932 (3512)		
TC81- 4	2580 (3170)		
TC81- 6	1565 (2752)		
TC81- 8	1880 (3006)		
TC81-11	2516 (4788)		
$\bar{x}$	2005 (3547)		3207 (4515)
S.D.	298 (563)		570 (535)
S.E.	80 (150)		202 (189)

*Pteropod swarm, not included in mean.

Table 8. Proportions of wet and dry biomass and caloric energy associated with different macrozooplankton groups at station 5.

Sample no.	Date	Taxonomic Group	Live wt. (g)	% Live wt.	Dry wt. (g)	% Dry wt.	Calories/g Dry wt.	Total Calories	Caloric Content (%)
TC79- 1	28/7/79	Hyperiidea	0.5317	2.44	0.1133	9.70	4 730	536	20.52
		Chaetognatha	0.2262	1.04	0.0258	2.20	5 013	129	4.94
		Coelenterata	0.1097	0.50	0.0029	0.25	1 876	6	0.21
		Ctenophora	20.6442	94.75	0.9611	82.33	1 712	1 645	63.01
		Pteropoda	0.0259	0.12	0.0056	0.48	4 232	24	0.91
		Decapoda	0.2294	1.05	0.0555	4.75	4 732	263	10.06
		Fish larvae	0.0217	0.10	0.0033	0.28	2 878	9	0.36
		Copepoda*	1.3807	5.96	0.3890	24.99	7 268	2 827	51.98
		Total [1]	21.7888		1.1674			2 612	
		Total [2]	23.1695		1.5565			5 439	
TC79- 9	17/8/79	Hyperiidea	-	-	0.0958	1.95	4 656	446	5.28
		Chaetognatha	-	-	0.1764	3.58	5 162	910	10.78
		Euphausiacea	-	-	0.0054	0.11	4 400	24	0.28
		Coelenterata	-	-	0.0401	0.81	1 923	77	0.91
		Ctenophora	-	-	4.5440	92.36	1 476	6 707	79.42
		Pteropoda	-	-	0.0061	0.12	4 060	25	0.29
		Decapoda	-	-	0.0489	0.99	4 980	243	2.88
		Polychaeta	-	-	0.0012	0.02	4 984	6	0.07
		Fish larvae	-	-	0.0021	0.04	2 878	6	0.07
		Copepoda*	-	-	2.8536	36.71	7 086	20 221	70.54
		Total [1]			4.9199			8 444	
		Total [2]			7.7735			28 665	

* not included in calculation of percentages
[1] total excluding copepod value
[2] total including copepod value

Table 8 (continued).

Sample no.	Date	Taxonomic Group	Live wt. (g)	% Live wt.	Dry wt. (g)	% Dry wt.	Calories/g Dry wt.	Total Calories	Caloric Content (%)
TC79-10	4/9/79	Hyperiidea	0.3374	0.28	0.0736	1.28	4 567	336	2.97
		Chaetognatha	1.2141	1.00	0.1296	2.25	5 140	666	5.89
		Euphausiacea	0.0688	0.06	0.0243	0.42	6 910	168	1.48
		Coelenterata	0.0449	0.04	0.033	0.06	1 876	6	0.05
		Ctenophora	118.2556	97.29	5.3972	93.72	1 777	9 591	84.88
		Pteropoda	1.5028	1.24	0.1077	1.87	3 967	427	3.78
		Decapoda	0.0117	0.01	0.0033	0.06	4 583	15	0.13
		Polychaeta	0.0110	0.01	0.0017	0.03	4 984	9	0.08
		Fish larvae	0.1025	0.08	0.0182	0.32	4 515	82	0.73
		Copepoda*	3.5282	2.82	1.2446	17.77	6 871	8 552	43.08
		Total[1]	121.5488		5.7588			11 300	
		Total[2]	125.0770		7.0034			19 852	
TC79-11	26/9/79	Chaetognatha	0.9237	0.40	0.0994	0.91	5 150	512	2.86
		Coelenterata	2.8110	1.22	0.1284	1.18	2 237	287	1.61
		Ctenophora	227.1364	98.38	10.6722	97.89	1 600	17 076	95.46
		Polychaeta	0.0087	<0.01	0.0024	0.02	4 984	12	0.07
		Copepoda	19.0560	7.62	6.0824	35.81	6 871	41 792	70.03
		Total[1]	230.8798		10.9025			17 887	
		Total[2]	249.9358		16.9849			59 679	

Table 8 (continued).

Sample no.	Date	Taxonomic Group	Live wt. (g)	% Live wt.	Dry wt. (g)	% Dry wt.	Calories/g Dry wt.	Total Calories	Caloric Content (%)
TC80-13	21/8/80	Hyperiidea	0.4243	0.20	0.0895	1.10	5 220	467	3.10
		Gammaridea	0.0792	0.04	0.0201	0.25	5 140	103	0.68
		Chaetognatha	3.8575	1.85	0.3324	4.10	5 327	1 771	11.76
		Euphausiacea	0.2578	0.12	0.0705	0.87	6 110	431	2.86
		Coelenterata	0.4854	0.23	0.0169	0.21	1 876	32	0.21
		Ctenophora	203.0172	97.55	7.5817	93.47	1 617	12 260	81.39
		Copepoda*	11.1226	5.07	3.5605	30.51	6 871	24 464	61.89
		Total [1]	208.1214		8.1110			15 064	
		Total [2]	219.2440		11.6715			39.528	
TC80-14	28/8/80	Hyperiidea	0.1053	0.51	0.0256	0.88	5 577	143	1.14
		Gammaridea	0.0438	0.21	0.0130	0.45	4 700	61	0.49
		Chaetognatha	0.6253	3.04	0.0614	2.12	5 247	322	2.59
		Euphausiacea	0.0594	0.29	0.0092	0.32	5 090	47	0.38
		Coelenterata	0.0396	0.19	0.0013	0.04	1 876	2	0.02
		Ctenophora	6.0634	29.51	0.2981	10.31	1 870	558	4.47
		Pteropoda	13.5886	66.13	2.4690	85.40	4 563	11 266	90.37
		Polychaeta	0.0233	0.11	0.0136	0.47	4 984	68	0.55
		Copepoda*	4.6898	18.58	1.6564	36.42	6 871	11 381	47.72
		Total [1]	20.5487		2.8913			12 467	
		Total [2]	25.2385		4.5477			23 848	

Table 8 (continued).

Sample no.	Date	Taxonomic Group	Live wt. (g)	% Live wt.	Dry wt. (g)	% Dry wt.	Calories/g Dry wt.	Total Calories	Caloric Content (%)
TC80-16	2/9/80	Hyperiidea	0.3762	0.43	0.0821	1.83	5 020	412	4.16
		Chaetognatha	2.8894	3.28	0.2866	6.40	5 103	1 462	14.75
		Euphausiacea	0.5712	0.65	0.1649	3.69	6 230	1 027	10.36
		Coelenterata	0.6127	0.69	0.0199	0.44	1 876	37	0.38
		Ctenophora	82.7262	93.78	3.8367	85.75	1 730	6 637	66.95
		Pteropoda	0.9733	1.10	0.0761	1.70	3 850	293	2.96
		Polychaeta	0.0633	0.07	0.0081	0.18	5 520	45	0.45
		Copepoda*	8.9399	9.20	2.6278	37.00	6 871	18 056	64.55
		Total [1]	88.2123		4.4743			9 913	
		Total [2]	97.1522		7.1021			27 969	
TC80-17	5/9/80	Hyperiidea	0.3304	0.08	0.0551	0.31	4 660	257	0.70
		Gammaridea	0.0557	0.01	0.0152	0.09	4 630	70	0.19
		Chaetognatha	3.7169	0.87	0.3856	2.16	4 933	1 902	5.16
		Euphausiacea	0.6660	0.16	0.2200	1.23	7 180	1 579	4.28
		Coelenterata	0.3143	0.07	0.0117	0.07	1 890	22	0.06
		Ctenophora	421.0555	98.80	17.1224	96.12	1 930	33 046	89.57
		Polychaeta	0.0187	<0.01	0.0028	0.02	6 130	17	0.05
		Copepoda*	19.5995	4.40	6.0739	25.43	6 871	41 734	53.08
		Total [1]	426.1575		17.8127			36 893	
		Total [2]	445.7570		23.8866			78 627	

Table 8 (continued).

Sample no.	Date	Taxonomic Group	Live wt. (g)	% Live wt.	Dry wt. (g)	% Dry wt.	Calories/g Dry wt.	Total Calories	Caloric Content (%)
TC80-18	10/9/80	Hyperiidea	0.2367	0.12	0.0477	0.61	4 770	227	1.50
		Gammaridea	0.0169	0.01	0.0053	0.07	3 980	21	0.14
		Chaetognatha	4.4769	2.26	0.4561	5.84	5 258	2 398	15.86
		Euphausiacea	0.0646	0.03	0.0167	0.21	6 180	103	0.68
		Coelenterata	0.2375	0.12	0.0079	0.10	2 960	23	0.15
		Ctenophora	192.5991	97.37	7.2593	92.98	1 690	12 268	81.16
		Decapoda	0.0212	0.01	0.0039	0.05	4 660	18	0.12
		Polychaeta	0.1434	0.07	0.0107	0.14	5 280	57	0.37
		Copepoda*	21.7765	9.92	6.9937	47.25	6 871	48 054	76.07
		Total [1]	197.7963		7.8077			15 115	
		Total [2]	219.5728		14.8014			63 169	
TC80-19	12/9/80	Hyperiidea	0.0336	0.02	0.0064	0.09	5 140	33	0.23
		Chaetognatha	3.9265	2.31	0.4122	5.70	5 180	2 135	15.00
		Euphausiacea	0.0228	0.01	0.0045	0.06	4 200	19	0.13
		Coelenterata	1.4260	0.84	0.0453	0.63	1 373	62	0.44
		Ctenophora	164.4274	96.70	6.7514	93.31	1 765	11 916	83.71
		Pteropoda	0.0525	0.03	0.0043	0.06	3 720	16	0.11
		Polychaeta	0.1441	0.08	0.0114	0.16	4 680	54	0.38
		Copepoda*	15.8378	8.52	5.1849	41.74	6 871	35 625	71.45
		Total [1]	170.0329		7.2355			14 235	
		Total [2]	185.8707		12.4203			49 860	

Table 8 (continued).

Sample no.	Date	Taxonomic Group	Live wt. (g)	% Live wt.	Dry wt. (g)	% Dry wt.	Calories/g Dry wt.	Total Calories	Caloric Content (%)
TC81- 2	5/8/81	Hyperiidea	0.3132	1.53	0.0705	7.41	4 463	315	17.12
		Gammaridea	0.0304	0.15	0.0116	1.21	4 600	53	3.89
		Chaetognatha	0.6536	3.20	0.0634	6.66	4 993	317	17.22
		Coelenterata	0.2731	1.34	0.0073	0.76	2 350	17	0.93
		Ctenophora(c)[3]	12.9695	63.55	0.5678	59.67	1 636	929	50.52
		Ctenophora(b)[4]	6.0683	29.74	0.2113	22.20	515	109	5.92
		Decapoda	0.0946	0.46	0.0196	2.06	5 023	98	5.35
		Polychaeta	0.0051	0.02	0.0002	0.02	4 984	1	0.06
		Copepoda*	1.4891	6.80	0.3913	29.14	7 355	2 878	61.02
		Total[1]	20.4078		0.9516			1 839	
		Total[2]	21.8969		1.3429			4 717	
TC81- 4	15/8/81	Hyperiidea	0.6170	1.38	0.1313	6.17	4 543	596	10.86
		Gammaridea	0.1586	0.36	0.0509	2.39	4 324	220	4.01
		Chaetognatha	3.0645	6.87	0.2726	12.81	4 533	1 236	22.50
		Coelenterata	1.5063	3.38	0.0552	2.59	1 915	107	1.92
		Ctenophora(c)	38.5065	86.31	1.5829	74.35	2 040	3 229	58.80
		Ctenophora(b)	0.6841	1.53	0.0192	0.90	1 585	30	0.55
		Decapoda	0.0777	0.17	0.0169	0.79	4 393	74	1.35
		Copepoda*	1.6406	3.55	0.4318	16.86	6 080	2 625	32.34
		Total[1]	44.6147		2.1290			5 492	
		Total[2]	46.2553		2.5608			8 117	

[3] cydippid
[4] beroid

Table 8 (continued).

Sample no.	Date	Taxonomic Group	Live wt. (g)	% Live wt.	Dry wt. (g)	% Dry wt.	Calories/g Dry wt.	Total Calories	Caloric Content (%)
TC81- 6	21/8/81	Hyperiidea	0.0199	0.03	0.0035	0.14	4 320	15	0.40
		Gammaridea	0.0841	0.14	0.0249	1.02	4 145	103	2.75
		Chaetognatha	0.5467	0.92	0.0564	2.31	4 710	266	7.07
		Coelenterata	1.8349	3.10	0.0611	2.50	1 774	108	2.88
		Ctenophora(c)	49.5663	83.63	2.0406	83.62	1 444	2 947	78.38
		Ctenophora(b)	7.1719	12.10	0.2457	10.07	1 160	285	7.58
		Decapoda	0.0339	0.06	0.0076	0.31	4 300	33	0.87
		Polychaeta	0.0048	0.01	0.0005	0.02	4 984	3	0.07
		Copepoda*	2.5378	4.11	0.8050	24.80	6 350	5 112	57.62
		Total [1]	59.2625		2.4403			3 760	
		Total [2]	61.8003		3.2453			8 872	
TC81- 8	7/9/81	Hyperiidea	0.4782	0.71	0.1105	3.77	5 160	570	10.36
		Chaetognatha	0.0573	0.08	0.0059	0.20	5 180	30	0.55
		Coelenterata	2.0441	3.03	0.0756	2.58	1 554	117	2.13
		Ctenophora(c)	63.7268	94.35	2.6906	91.94	1 754	4 719	85.77
		Ctenophora(b)	1.2338	1.83	0.0439	1.50	1 493	66	1.19
		Copepoda*	3.5957	5.05	0.8277	22.05	6 984	5 781	51.23
		Total [1]	67.5402		2.9263			5 502	
		Total [2]	71.1359		3.7540			11 283	

Table 8 (continued).

Sample no.	Date	Taxonomic Group	Live wt. (g)	% Live wt.	Dry wt. (g)	% Dry wt.	Calories/g Dry wt.	Total Calories	Caloric Content (%)
TC81-11	12/9/81	Hyperiidea	0.8804	3.78	0.1754	14.41	4 742	832	27.17
		Chaetognatha	0.2277	0.98	0.0215	1.77	5 330	114	3.74
		Euphausiacea	0.2312	0.99	0.0659	5.41	6 635	437	14.28
		Coelenterata	0.8667	3.72	0.0332	2.73	2 310	77	2.50
		Ctenophora(c)	16.7596	71.99	0.7505	61.68	1 808	1 357	44.33
		Ctenophora(b)	4.3163	18.54	0.1704	14.00	1 434	244	7.98
		Copepoda*	4.7624	16.98	1.3272	52.17	6 871	9 119	74.87
		Total [1]	23.2819		1.2168			3 061	
		Total [2]	28.0443		2.5440			12 180	

Table 9. Proportions of wet and dry biomass and caloric energy associated with different macrozooplankton groups at station 51.

Sample no.	Date	Taxonomic Group	Live wt. (g)	% Live wt.	Dry wt. (g)	% Dry wt.	Calories/g Dry wt.	Total Calories	Caloric Content (%)
TC79- 2	29/7/79	Hyperiidea	2.2179	3.23	0.4590	12.48	4 740	2 176	20.91
		Gammaridea	0.0126	0.02	0.0038	0.10	4 722	18	0.17
		Chaetognatha	0.5067	0.74	0.0551	1.50	5 087	281	2.70
		Euphausiacea	0.4091	0.60	0.1016	2.76	5 767	586	5.63
		Coelenterata	0.1538	0.22	0.0025	0.07	1 876	5	0.04
		Ctenophora	65.2312	95.03	3.0360	82.53	2 387	7 247	69.65
		Pteropoda	0.0243	0.04	0.0034	0.09	3 859	13	0.13
		Decapoda	0.0516	0.08	0.0109	0.30	5 000	55	0.52
		Mysidacea	0.0323	0.05	0.0065	0.18	3 986	26	0.25
		Copepoda*	3.0166	4.21	0.6545	15.10	6 871	4 497	30.18
		Total [1]	68.6395		3.6788			10 407	
		Total [2]	71.6561		4.8296			14 904	
TC79- 8	16/8/79	Hyperiidea	-	-	0.1044	3.80	4 817	503	5.95
		Gammaridea	-	-	0.0271	0.99	3 565	97	1.14
		Chaetognatha	-	-	0.0586	2.13	5 247	308	3.64
		Euphausiacea	-	-	0.5400	19.64	6 430	3 472	41.06
		Coelenterata	-	-	0.0216	0.79	1 876	41	0.48
		Ctenophora	-	-	1.9893	72.36	2 010	3 999	47.29
		Decapoda	-	-	0.0058	0.21	4 583	27	0.32
		Polychaeta	-	-	0.0022	0.08	4 984	11	0.13
		Copepoda*	-	-	3.2923	54.50	6 871	22 621	72.79
		Total [1]			2.7490			8 458	
		Total [2]			6.0413			31 079	

* not included in calculation of percentages
[1] total excluding copepod value
[2] total including copepod value

Table 9 (continued).

Sample no.	Date	Taxonomic Group	Live wt. (g)	% Live wt.	Dry wt. (g)	% Dry wt.	Calories/g Dry wt.	Total Calories	Caloric Content (%)
TC79-12	26/9/79	Hyperiidea	0.5940	0.40	0.1408	1.96	5 110	720	4.21
		Gammaridea	0.0207	0.01	0.0042	0.06	6 290	27	0.16
		Chaetognatha	4.4399	2.97	0.4898	6.83	5 720	2 802	16.39
		Euphausiacea	0.1936	0.13	0.0599	0.84	7 070	424	2.48
		Coelenterata	1.1746	0.78	0.0581	0.81	2 267	132	0.77
		Ctenophora	143.1388	95.65	6.4132	89.37	2 017	12 935	75.66
		Polychaeta	0.0798	0.05	0.0096	0.13	5 990	58	0.34
		Copepoda*	28.3622	15.93	10.4152	59.21	6 871	71 563	80.72
		Total [1]	149.6414		7.1757			17 098	
		Total [2]	178.0036		17.5910			88 661	
TC80-15	31/8/80	Hyperiidea	0.3726	0.27	0.0702	0.90	4 673	328	2.24
		Gammaridea	0.4240	0.31	0.0995	1.27	5 223	519	3.55
		Chaetognatha	0.1584	0.12	0.0154	0.20	5 860	90	0.62
		Euphausiacea	0.2206	0.16	0.0669	0.85	6 497	435	2.97
		Coelenterata	0.0859	0.06	0.0024	0.03	1 876	5	0.03
		Ctenophora	135.5813	99.08	7.5817	96.75	1 750	13 268	90.60
		Copepoda*	1.7832	1.29	0.3433	4.20	6 871	2 359	13.87
		Total [1]	136.8428		7.8360			14 645	
		Total [2]	138.6260		8.1793			17 004	

Table 9 (continued).

Sample no.	Date	Taxonomic Group	Live wt. (g)	% Live wt.	Dry wt. (g)	% Dry wt.	Calories/g Dry wt.	Total Calories	Caloric Content (%)
TC81- 1	5/8/81	Hyperiidea	0.5149	0.37	0.1021	0.72	4 168	426	0.70
		Gammaridea	0.0943	0.07	0.0299	0.21	4 340	130	0.21
		Chaetognatha	2.1460	1.55	0.2047	1.44	4 672	956	1.58
		Euphausiacea	29.8886	21.63	9.1505	64.46	5 775	52 844	87.28
		Coelenterata	0.6114	0.44	0.0212	0.15	1 125	24	0.04
		Ctenophora(c)	88.9203	64.36	4.0640	28.63	1 388	5 641	9.32
		Ctenophora(b)	15.8367	11.46	0.6037	4.25	740	447	0.74
		Pteropoda	0.0083	0.01	0.0009	0.01	3 859	4	0.01
		Decapoda	0.0426	0.03	0.0085	0.06	4 480	38	0.06
		Polychaeta	0.0999	0.07	0.0093	0.07	3 947	37	0.06
		Copepoda*	7.0575	4.86	1.9437	12.04	6 140	11 934	16.47
		Total[1]	138.1630		14.1948			60 547	
		Total[2]	145.2205		16.1385			72 481	
TC81- 3	11/8/81	Hyperiidea	0.7903	0.73	0.1653	2.25	4 636	766	2.90
		Gammaridea	0.8610	0.80	0.2290	3.12	4 600	1 054	3.98
		Chaetognatha	1.8082	1.68	0.1707	2.33	5 106	872	3.30
		Euphausiacea	9.0852	8.44	2.7926	38.08	5 768	16 108	60.90
		Coelenterata	0.8910	0.83	0.0293	0.40	1 970	58	0.22
		Ctenophora(c)	88.3903	82.10	3.7000	50.45	1 940	7 178	27.14
		Ctenophora(b)	5.0878	4.73	0.1929	2.63	985	190	0.72
		Pteropoda	0.7331	0.68	0.0512	0.70	4 135	212	0.80
		Polychaeta	0.0193	0.02	0.0027	0.04	4 984	14	0.05
		Copepoda*	9.3214	7.97	2.5231	25.60	6 820	17 208	39.41
		Total[1]	107.6662		7.3338			26 452	
		Total[2]	116.9876		9.8569			43 660	

Table 9 (continued).

Sample no.	Date	Taxonomic Group	Live wt. (g)	% Live wt.	Dry wt. (g)	% Dry wt.	Calories/g Dry wt.	Total Calories	Caloric Content (%)
TC81- 5	19/8/81	Hyperiidea	2.4587	1.80	0.4701	5.00	4 656	2 189	6.97
		Gammaridea	2.4234	1.78	0.5906	6.29	4 533	2 677	8.52
		Chaetognatha	5.8801	4.30	0.5548	5.91	4 778	2 651	8.44
		Euphausiacea	8.5841	6.28	2.5469	27.11	5 926	15 093	48.05
		Coelenterata	0.1961	0.14	0.0056	0.06	1 876	10	0.03
		Ctenophora(c)	109.6272	80.14	4.9300	52.48	1 722	8 489	27.03
		Ctenophora(b)	7.5283	5.50	0.2802	2.98	830	233	0.74
		Decapoda	0.0404	0.03	0.0081	0.09	4 630	38	0.12
		Polychaeta	0.0530	0.04	0.0069	0.07	4 240	29	0.09
		Copepoda*	12.0824	8.12	3.5788	27.59	6 871	24 590	43.91
		Total [1]	136.7913		9.3932			31 409	
		Total [2]	148.8737		12.9720			55 999	
TC81- 7	4/9/81	Hyperiidea	4.1259	2.06	0.8542	6.66	4 428	3 782	8.93
		Gammaridea	0.0602	0.03	0.0167	0.13	5 250	88	0.21
		Chaetognatha	9.8337	4.92	0.9383	7.32	5 428	5 093	12.02
		Euphausiacea	8.0370	4.02	2.6071	20.33	6 124	15 966	37.68
		Coelenterata	0.9563	0.48	0.0352	0.27	2 802	99	0.23
		Ctenophora(c)	148.7308	74.40	7.3375	57.21	2 186	16 040	37.86
		Ctenophora(b)	28.0735	14.04	1.0289	8.02	1 225	1 260	2.97
		Polychaeta	0.0989	0.05	0.0081	0.06	4 984	40	0.10
		Copepoda*	22.3293	10.05	6.8789	34.91	7 754	53 339	55.73
		Total [1]	199.9163		12.8260			42 368	
		Total [2]	222.2456		19.7049			95 707	

Table 9 (continued).

Sample no.	Date	Taxonomic Group	Live wt. (g)	% Live wt.	Dry wt. (g)	% Dry wt.	Calories/g Dry wt.	Total Calories	Caloric Content (%)
TC81-10	12/9/81	Hyperiidea	1.4148	0.81	0.3015	2.93	5 278	1 591	5.43
		Gammaridea	0.4698	0.27	0.1202	1.17	5 510	662	2.26
		Chaetognatha	15.4290	8.88	1.5502	15.05	5 336	8 272	28.21
		Euphausiacea	3.7575	2.16	1.3335	12.95	6 290	8 388	28.61
		Coelenterata	0.2758	0.16	0.0010	0.01	1 190	1	<0.01
		Ctenophora(c)	143.6773	82.69	6.3430	61.60	1 568	9 946	33.92
		Ctenophora(b)	8.6741	4.99	0.6436	6.25	676	435	1.48
		Polychaeta	0.0569	0.03	0.0049	0.05	4 984	25	0.08
		Copepoda*	19.3948	10.04	6.4919	38.67	6 871	44 606	60.34
		Total[1]	173.7552		10.2978			29 320	
		Total[2]	193.1500		16.7897			73 926	

Table 10. Proportion of total macrozooplankton caloric energy contained in Ctenophora, Chaetognatha and Hyperiidea groups, in all three combined and in next most significant group (Station 5).

Sample no.	Ctenophora percent	Chaetognatha percent	Hyperiidea percent	Combined	Next Significant Group	Percent
TC79- 1	63.0	4.9	20.5	88.4	Decapoda	10.1
TC79- 9	79.4	10.8	5.3	95.5	Decapoda	2.9
TC79-10	84.9	5.9	3.0	93.8	Pteropoda	3.8
TC79-11	95.5	2.9	0.0	98.4	Coelenterata	1.6
TC80-13	81.4	11.8	3.1	96.3	Euphausiacea	2.9
TC80-14	4.5	2.6	1.1	8.2	Pteropoda	90.4
TC80-16	67.0	14.8	4.2	86.0	Euphausiacea	10.4
TC80-17	89.6	5.2	0.7	95.5	Euphausiacea	4.3
TC80-18	81.2	15.9	1.5	98.6	Euphausiacea	0.7
TC80-19	83.7	15.0	0.2	98.9	Coelenterata	0.4
TC81- 2	56.4	17.2	17.1	90.7	Decapoda	5.4
TC81- 4	59.4	22.5	10.9	92.8	Gammaridea	4.0
TC81- 6	86.2	7.0	0.4	93.6	Coelenterata	2.8
TC81- 8	87.0	0.6	10.4	98.0	Coelenterata	2.1
TC81-11	52.3	3.7	27.2	83.2	Euphausiacea	14.3

Table 11. Proportion of total macrozooplankton caloric energy contained in Ctenophora, Euphausiacea and Chaetognatha groups, in all three combined, and in next most significant group (Station 51).

Sample no.	Ctenophora percent	Euphausiacea percent	Chaetognatha percent	Combined	Next Significant Group	Percent
TC79- 2	69.7	5.6	2.7	78.0	Hyperiidea	20.9
TC79- 8	47.3	41.1	3.6	92.0	Hyperiidea	6.0
TC79-12	75.7	2.5	16.4	94.6	Hyperiidea	4.2
TC80-15*	90.6	3.0	0.6	94.2	Gammaridea	3.6
TC81- 1	10.1	87.3	1.6	99.0	Hyperiidea	0.7
TC81- 3	27.9	60.9	3.3	92.1	Gammaridea	4.0
TC81- 5	27.8	48.1	8.4	84.3	Gammaridea	8.5
TC81- 7	40.8	37.7	12.0	90.5	Hyperiidea	8.9
TC81-10	35.4	28.6	28.2	92.2	Hyperiidea	5.4

*from 50 m only.

Table 12. Sample volumes and total wet weight, dry weight and caloric content per 1000 m^3 for macrozooplankton collected at Station 5.

Sample No.	Volume (m^3)	Wet weight g/1000 m^3	Dry weight g/1000 m^3	Energy Calories/1000 m^3
TC80-13	258.4	805.57	31.39	58 303
TC80-14	232.6	88.37	12.43	53 617
TC80-16	348.8	252.92	12.82	28 426
TC80-17	257.0	1 658.21	69.30	143 556
TC80-18	251.0	788.02	31.11	60 225
TC80-19	202.4	839.99	35.77	70 323
TC81- 2	229.7	88.86	4.14	8 005
TC81- 4	302.7	147.37	7.04	18 143
TC81- 6	229.1	258.66	10.65	16 409
TC81- 8	189.2	356.98	15.49	29 083
TC81-11	275.4	84.53	4.43	11 115
$\bar{x}$	252.4	488.13	21.32	45 200
S.D.	45.1	490.61	19.47	39 269

Table 13. Sample volumes and total wet weight, dry weight and caloric content per 1000 m^3 for macrozooplankton collected at Station 51.

Sample No.	Volume (m^3)	Wet weight g/1000 m^3	Dry weight g/1000 m^3	Energy Calories/1000 m^3
TC80-15*	258.4	529.57	30.34	56 674
TC81- 1	628.5	219.82	22.58	96 334
TC81- 3	704.9	152.75	10.40	37 524
TC81- 5	764.5	178.93	12.28	41 085
TC81- 7	472.0	423.56	27.18	89 763
TC81-10	404.4	429.67	25.47	72 501
$\bar{x}$	594.9	280.95	19.58	67 441
S.D.	152.8	135.13	7.73	27 149

*from 50 m only

Table 14. Total wet weight, dry weight and caloric content per 100 m^2 for macrozooplankton at Stations 5 and 51 (excluding copepods).

Station	Sample No.	Wet weight g/100 m^2	Dry weight g/100 m^2	Energy Calories/100 m^2
5	TC80-13	4 028	157	291 515
	TC80-14	442	62	268 085
	TC80-16	1 265	64	142 130
	TC80-17	8 291	347	717 780
	TC80-18	3 940	156	301 125
	TC80-19	4 200	179	351 615
	TC81- 2	444	21	40 025
	TC81- 4	737	35	90 715
	TC81- 6	1 293	53	82 045
	TC81- 8	1 785	77	145 415
	TC81-11	423	22	55 575
51	TC81- 1	4 396	451.6	1 926 680
	TC81- 3	3 055	208.0	750 480
	TC81- 5	3 579	245.6	821 700
	TC81- 7	8 471	543.6	1 795 260
	TC81-10	8 593	509.4	1 450 020

Table 15. Live weight, dry weight and calories per 100 m^2 for Ctenophora at Stations 5 and 51.

Station	Sample No.	Wet weight g/100 m^2	Dry weight g/100 m^2	Energy Calories/100 m^2
5	TC80-13	3 928.35	146.70	237 229
	TC80-14	130.34	6.41	11 995
	TC80-16	1 185.87	54.99	95 140
	TC80-17	8 191.74	333.12	642 918
	TC80-18	3 836.64	144.61	244 382
	TC80-19	4 061.94	166.78	294 368
	TC81- 2	414.41	16.96	22 595
	TC81- 4	647.35	26.46	53 832
	TC81- 6	1 238.28	49.90	70 537
	TC81- 8	1 716.72	72.26	126 453
	TC81-11	382.64	16.72	29 067
	$\bar{x}$	2 339.48	94.08	166 229
	S.D.	2 453.40	97.93	186 134
	C.V.	104.9	104.1	111.9
51	TC81- 1	3 333.56	148.53	193 731
	TC81- 3	2 652.23	110.45	209 051
	TC81- 5	3 064.89	136.30	228 175
	TC81- 7	7 491.71	354.51	733 051
	TC81-10	7 534.69	345.53	513 403
	$\bar{x}$	4 815.42	219.06	375 482
	S.D.	2 474.70	120.38	239 432
	C.V.	51.4	55.0	63.8

Table 16. Live weight, dry weight and calories per 100 m^2 for Hyperiidea at Stations 5 and 51.

Station	Sample No.	Wet weight g/100 m^2	Dry weight g/100 m^2	Energy Calories/100 m^2
5	TC80-13	8.21	1.73	9 036
	TC80-14	2.26	0.55	3 074
	TC80-16	5.39	1.18	5 906
	TC80-17	6.43	1.07	5 000
	TC80-18	4.72	0.95	4 522
	TC80-19	0.83	0.16	815
	TC81- 2	6.82	1.53	6 857
	TC81- 4	10.19	2.17	9 845
	TC81- 6	1.15	0.08	327
	TC81- 8	12.64	2.92	15 063
	TC81-11	15.98	3.18	15 105
	$\bar{x}$	6.78	1.41	6 868
	S.D.	4.76	1.03	5 023
	C.V.	70.2	72.9	73.1
51	TC81- 1	16.39	3.25	13 556
	TC81- 3	22.42	4.96	21 734
	TC81- 5	64.32	12.30	57 266
	TC81- 7	174.83	36.20	160 258
	TC81-10	69.97	14.91	78 684
	$\bar{x}$	69.59	14.32	66 300
	S.D.	63.56	13.17	58 803
	C.V.	91.3	91.9	88.7

Table 17. Live weight, dry weight and calories per 100 m^2 for Chaetognatha at Stations 5 and 51.

Station	Sample No.	Wet weight g/100 m^2	Dry weight g/100 m^2	Energy Calories/100 m^2
5	TC80-13	74.64	6.43	34 269
	TC80-14	13.44	1.32	6 922
	TC80-16	41.42	4.11	20 958
	TC80-17	72.31	7.50	37 004
	TC80-18	89.18	9.09	47 769
	TC80-19	97.00	10.18	52 742
	TC81- 2	14.23	1.38	6 900
	TC81- 4	50.62	4.50	20 416
	TC81- 6	11.93	1.23	5 805
	TC81- 8	1.51	0.15	793
	TC81-11	4.13	0.39	2 070
	$\bar{x}$	42.76	4.21	21 423
	S.D.	35.87	3 63	18 839
	C.V.	83.9	86.2	87.9
51	TC81- 1	68.29	6.51	30 422
	TC81- 3	51.30	4.84	24 741
	TC81- 5	153.83	14.51	69 353
	TC81- 7	416.68	39.76	215 805
	TC81-10	736.06	76.66	409 100
	$\bar{x}$	285.23	28.46	149 884
	S.D.	291.37	30.35	164 283
	C.V.	102.2	106.7	109.6

Table 18. Live weight, dry weight and calories per 100 m^2 for Euphausiids at Stations 5 and 51.

Station	Sample No.	Wet weight g/100 m^2	Dry weight g/100 m^2	Energy Calories/100 m^2
5	TC80-13	4.99	1.36	8 340
	TC80-14	1.28	0.20	1 010
	TC80-16	8.19	2.36	14 722
	TC80-17	12.96	4.28	30 720
	TC80-18	1.29	0.33	2 052
	TC80-19	0.56	0.11	469
	TC81- 2	0	0	0
	TC81- 4	0	0	0
	TC81- 6	0	0	0
	TC81- 8	0	0	0
	TC81-11	4.19	1.20	7 934
	$\bar{x}$	3.41	1.26	5 932
	S.D.	3.97	1.18	9 546
	C.V.	116.4	93.7	160.9
51	TC81- 1	951.11	259.62	1 681 591
	TC81- 3	257.77	79.23	457 029
	TC81- 5	224.57	66.63	394 846
	TC81- 7	340.55	110.47	676 525
	TC81-10	185.83	65.95	414 837
	$\bar{x}$	391.97	116.38	724 966
	S.D.	317.73	82.08	546 449
	C.V.	81.1	70.5	75.4

REFERENCES

Dunbar, M. J. 1940. On the size distribution and breeding cycles of marine planktonic animals from the Arctic. J. Anim. Ecol. 9(2): 215-226.

Dunbar, M. J. 1941. The breeding cycle of Sagitta elegans arctica (Aurivillius). Can. J. Res. D19(9): 258-266.

Dunbar, M. J. 1946. On Themisto libellula in Baffin Island coastal waters. J. Fish. Res. Board Can. 6(6): 419-434.

Dunbar, M. J. 1957. The determinants of production in northern seas. A study of the biology of Themisto libellula. Can. J. Zool. 35(6): 797-819.

Dunbar, M. J. 1962. The life cycle of Sagitta elegans in Arctic and subarctic seas, and the modifying effects of hydrographic differences in the environment. J. Mar. Res. 20(1): 76-91.

Grainger, E. H. 1971. Biological oceanographic observations in Frobisher Bay. II. Zooplankton data, 1967-1970. Fish. Res. Board Can. Tech. Rep. 266: 61 p.

Lovrity, J. E. 1982. Oceanographic data from Frobisher Bay in the Eastern Canadian Arctic for the year 1981. Can. Data Rep. Fish. Aquat. Sci. 343: v + 45 p.

Percy, J. A. and F. J. Fife. 1980. The relative energy content of the macrozooplankton. In: (Arctic Biological Station, 1980.) A marine biological study of Brevoort Harbour and nearby waters of eastern Baffin Island. A report prepared for the Offshore Environment Division, Department of Indian Affairs and Northern Development. Can. MS Rep. Fish. Aquat. Sci. 1557: 75-83.

Percy, J. A. and F. J. Fife. 1981. The biochemical composition and energy content of arctic marine macrozooplankton. Arctic 34(4): 307-313.

Phillipson, J. 1964. A miniature bomb calorimeter for small biological samples. Oikos 15: 130-139.

Sands, N. J. 1978. Ecological studies on the deep water pelagic community of Korsfjorden, Western Norway. Comparison of the catch of the more numerous species by two different nets. Sarsia 63(4): 237-246.